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MEMO

TO: **Tom Keefe**

FROM: **Steve Piper**

Cc: **Ron Kenny**

DATE: **April 1, 2008**

RE: **Chelsea Terminal Rack Exhaust Testing**

On March 7, 2008, myself and Paul Murphy collected air samples from the residual oil loading operations as a means to better characterize the rack contribution to the overall VOC emissions ducted to the existing odor control device. During previous testing efforts sampling focused on the combined exhaust of the residual oil storage tanks and the residual oil rack loading lanes as well as sampling of individual tank within the tank farm. During pre-permit application meetings with the MADEP, they expressed interest in knowing how the actual residual oil loading rack emissions compared with EPA-published emission factors (AP-42).

The test plan was to collect a total of six bag samples; three from the headspace of trucks during residual loading (splash loading), and a corresponding three samples from the flex hose collecting the displaced vapors from the residual oil loading. The bag samples were then taken to a nearby lab for analysis using Method 25A (calibrated to propane). Results of the sample analyses are summarized below.

Residual Oil Type	Truck Headspace (ppm)	Vapor Collection Duct (ppm)
2.2%	2,860	1,120
1.0%	6,100	1,900
0.5%	4,350	4,700*
AVG	4,437	1,510

*Sample disregarded, suspect that the sampling tube was contaminated with oil residue.

The average headspace concentration in the trucks of 4,437 ppm was slightly higher than the average headspace concentrations in the residual oil storage tanks of 3,547 ppm (a lot more samples collected). The difference seems rationale given that the trucks were testing during an active top loading event whereas the majority of tank samples were collected during periods of no activity.

An attempt was made to measure the actual flow in each vapor collection duct. The purpose was to confirm the design exhaust rate of 300 cfm per loading lane and to

provide for and ability to calculate the capture efficiency. However, the pitot tube repeatibly became clogged by the tar buildup on the inside of the flex hose during each attempt to measure flow.

To calculate potential emissions from the residual loading rack lanes, we used the residual oil throughput limitation of 500,000,000 gallons/year (from Ron Kenny) and the loading pump rate of 500 gallons/minute to calculate that the loading could operate 16,667 hours/year (for one lane or less hours for multiple lanes). To convert from VOC concentration (ppm) to annual quantity of VOC emissions, the design exhaust rate of 300 cfm and the ideal gas law for a 100 ^{0}F air steam was used. For the purpose of "potential" emission calculation, a concentration of 2,000 ppm was used (5% higher than highest test result and consistant with concentrations measured at the control system inlet. Based on the 2,000 ppm potential concentration, the potential uncontrolled VOC emissions (as propane) from truck loading of residual oil would be 32.4 tpy.

$$\frac{2{,}000\ ft^3}{10^6\ ft^3} * \frac{300\ ft^3}{min} * \frac{60\ min}{hour} * \frac{16{,}667\ hr}{year} * \frac{lb\ mole}{407\ ft^3} * \frac{44\ lb}{lb\ mole} * \frac{1\ ton}{2{,}000\ lb} = 32.4\ tpy$$

Back-calculating the uncontrolled emission factor would indicate that the residual oil truck loading operation emits 0.13 lb/10^3 gallons loaded. The current emission factor published by EPA (AP-42) is 0.0003 lb/10^3 gallons loaded.

Based on the emission control strategy being proposed of 90% capture efficiency and 99% VOC destruction efficiency of the captures vapors, the controlled potential emissions would be 3.5 tpy from residual truck loading.